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ABSTRACT

This guide is intended for superintendents and central office staff in small, rural school districts who are considering ways of using technology in the classroom. It provides information about why technology is worth the trouble and what it can accomplish, lays out the basic issues and tasks involved in integrating technology into classroom instruction, and points to other necessary resources. Sections of this guide cover: (1) the benefits of computers, the Internet, and other technology for students and teachers; (2) the minimum that an administrator should know about technology; (3) where to start with regard to building interest and support and initiating a formal planning process for technology integration; (4) development of a technology plan (establishing a planning committee, forming an instructional vision, auditing current resources); (5) components of a good technology plan; (6) covering technology costs and finding new funds; (7) ongoing staff development and training; (8) assuring equitable technology access for students and teachers; (9) how to get troubleshooting help; (10) how to keep systems up-to-date; and (11) the most common pitfalls in technology planning and use and how to avoid them. Sections contain references and additional resources, many of which are available on the World Wide Web. (SV)

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Edited by
Sharon Adams
Marilyn Heath

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Putting Technology *into the* Classroom:

A Guide for Rural Decision Makers

Martha Boethel
K. Victoria Dimock
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Edited by
Sharon Adams
Marilyn Heath

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BEST COPY AVAILABLE

Right now, in almost every school district in the country, someone is thinking about using technology in the classroom. Schools everywhere, it seems, are buying computers, rewiring buildings, logging on to the Internet. But for staff in many small, rural schools, finding the vision, resources, person-power, and know-how to integrate technology and instruction seems like an almost impossible task.

This guide is designed to help make that task possible.

s this guide written for?

It's for people in sm..ll, rural school districts who are considering ways of using technology in the classroom, or who are wondering how to get started. Though it should be helpful to anyone interested in the subject, the guide is written with two primary audiences in mind: *superintendents* and *other central office staff* who are charged with making technology decisions.

is the guide intended to accomplish?

To provide you, or others you might need to convince, with information about why technology is worth the trouble and what it can accomplish.
In spite of its sizable bandwagon, technology still appears to many people to be more trouble and expense than it's worth, especially when a school is struggling to find ways of replacing a broken-down bus or meeting the latest state mandate. But there are compelling reasons for every school district to consider technology alternatives. This guide offers a concise summary of those reasons.

To lay out the basic issues and tasks involved in integrating technology into classroom instruction.
Using technology effectively is a big challenge. Fortunately, most of the problems and pitfalls have been discovered by other folks. The guide suggests an experience-based, step-by-step approach to planning and implementation. It also lists many of the common problems schools encounter, and strategies for avoiding them.

To point you to the resources you'll need.
An amazing array of information is available to help schools in planning for technology use, in locating funding and other supports, and in linking to service providers who can offer advice and assistance. We have listed resources that are easily accessible and of practical use after each major topic.

With all the other things on my plate, why should I care?

More and more, students need technology skills in order to "make it" in the workplace and in higher education.

The demand for high-skilled workers is rising much faster than the demand for low-skilled workers, and workplaces where computers are used account for much of this increase. According to one source, by the year 2000, more than half of all jobs in the nation will require some level of skill in computer and network use.

Businesses are also looking for a different kind of worker than in times past. In today's economy, businesses constantly need to redesign their products and services and to create new, more innovative ones. They need employees who can work collaboratively to solve problems, workers who are flexible, innovative, and self-directed. Used in the right ways, educational technology helps to build these traits and skills.

Technology is a Great Teaching Tool

The most effective teaching engages students in explorations

Explore the Web for instructional resources.

Virtual Plant Cell
http://ampere.scale.uiuc.edu/~m-lexa/cell/cell.html

Into the Wormhole
http://intothecosmos.com/

The Math Forum
http://forum.swarthmore.edu/

Global Schoolhouse
http://archives.gsn.org/ongoing/

Learning Outfitters
http://www.adventureonline.com/nile/

The Louvre
http://mistral.culture.fr/louvre/anglais/musee/musee.htm

University of Texas, map collection
http://www.lib.utexas.edu/

Library of Congress American Memory collection
http:// memory.loc.gov/ammem/

Natural History Museum of London
http://www.nhm.ac.uk/

and problem-solving activities that are meaningful to their lives. Technology can contribute to active learning by offering ideas and activities from thoughtful scientists, teachers, mathematicians, writers, and other specialists around the world. For example, the Internet website of the Franklin Institute Science Museum includes a link to a "virtual plant cell." This fascinating interior view provides electronmicrographs of a plant cell. The viewer can focus on a portion of the cell and move through more and more detailed pictures of its components. These intricate pictures of life can speak to a youngster who has never glimpsed that "small world."

For a look at bigger subjects, students could try the site entitled A Wormhole in the Cosmos. This collection of pictures, explanations, and resources reports current news of the cosmos and provides commentary on such topics as wormholes, black holes, supernovas and neutrinos. It also offers a bulletin board for questions about astronomy that range from a 7-year old's query "What is the tenth planet?" to a high school student's request "What happens to a star when it becomes a Red Giant?" This mixture of posted information and active exchange between readers and experts shows why the Internet has been described as a living, everchanging resource.

Technology Enhances Communication and Collaboration

As well as connecting students with adults, the online network links young people around the world through email or World Wide Web connections. Kids can join in conversations with other kids, contribute to student-generated

research projects, or compare their mathematics prowess with other young scholars. For example, every week the Math Forum, an interactive site on the Web sponsored by Swarthmore College in Swarthmore, Pennsylvania, posts challenging problems for elementary, middle school and high school students.The responses, including students' explanations of their strategies, are displayed on the site. The Forum is essentially an international discussion group for young mathematicians.

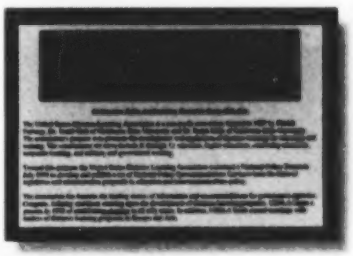
Technology can also support informal conversations that can enhance students' understanding of others. The traditional pen pal experience enters the electronic age with the benefit of kid discussion groups and online bulletin boards. The Global Schoolhouse project connects schools around the world for classroom topics as well as friendship.

Other two-way technologies such as interactive television and video conferencing create opportunities for classes to "meet" electronically in a live (synchronous) situation. In fact, some students earn complete programs and certificates "at a distance." Information about distance learning can be obtained from the U.S. Distance Learning Association site:

http://www.usdla.org

or contact:

U.S. Distance Learning Association
1240 Central Boulevard
Brentwood, CA 94513
(925) 513-4253



Technology Erases Barriers of Distance and Geography.

A teacher in rural Arkansas says, "We have kids here who've never been past Pine Bluff and now the Internet has put us in touch with the world." Students in Arkansas, or anywhere for that matter, can take a virtual trip down the Nile through Learning Outfitters, an Internet site that sponsors adventurers in various remote and exotic regions throughout the world. The travelers record their journey through pictures and comments that are displayed on the Web. They provide journals of their daily experiences and

connect to classrooms, responding to students' questions about their surroundings. The Nile is only one destination for this adventurous group—trips to Mount Everest, the Mayan ruins in Central America, a retracing of Magellan's world-circling voyage, and an Arctic adventure to the North Pole are also presented through pictures and text.

Another kind of international exploration is offered by the thousands of museums, libraries, discovery centers, aquaria, and other educational organizations that provide parts of their collections and exhibits online. Selected paintings and sculptures from the Louvre in Paris, the University of Texas' map collection, the Library of Congress' photos from the Civil War, exhibits from London's Natural History Museum—these give us a look at the world's intellectual treasures through digitized images and commentary from historians, librarians, curators, and archivists.

Technology allows teachers access to help they might need.

In addition to the multitude of instructional resources available online, educators can use the Internet as a source for professional enrichment and a way to connect with other educators. Many teachers participate in electronic discussion groups where they can get quick answers to technology-related questions or discuss lesson plans and instructional issues with other teachers. See, for example, Internet Connections at the Mid-Continent Regional Educational Laboratory's web site, or the professional support materials for mathematics and science teachers at the Eisenhower National Clearinghouse site.

Resources for professional development

Mid-Continent Regional Educational Laboratory
http://www.mcrel.org/connect/techined.html

Eisenhower National Clearinghouse
http://www.enc.org

eSchool Online
http://www.actv.com/newpage/internet/middle.html

Online training regarding technology use and other topics is also increasingly available. Video links can be used for staff development as well as for distance learning classes using new software tools such as eSchool Online™, a product of ACTV, Inc.

Technology can save schools time and money, helping them to run more efficiently.

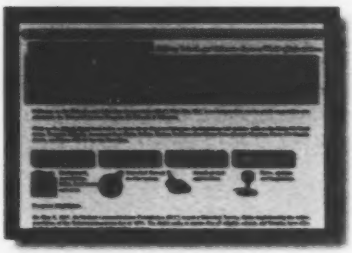
The priority for technology in schools should be instructional use. But technology also can provide administrative support. E-mail offers a convenient, reliable way for school staffs to keep in touch. Electronic enrollment, attendance-taking, grade-reporting, ordering and other record-keeping procedures can streamline paperwork and save precious resources. For example, one administrator reports substantial savings by generating purchase orders online rather than by the traditional, pencil-and-paper methods.

The Internet is another great research tool for administrators who want to plan, or just need advice. There are many Internet sites that provide information for ways to improve administrative support of a school or school district.

This is a movement that won't go away. The longer you wait, the more catching up you'll have to do.

In 1995, schools nationwide added a million computers. Almost two-thirds of all public schools are now linked to the Internet. With so much activity on the Internet, plans are being made for Internet II. Federal and state incentives for technology use are piling up. The idea that "this, too, shall pass"—a reality for so many educational fads and trends—simply does not apply to technology and telecommunications.

Beginning January 1, 1998, the Snowe-Rockefeller-Exon-Kerrey provisions of the Telecommunications Act of 1996, part of President Clinton's initiative to connect all schools to the Internet by the Year 2000, will serve as an impetus for schools to join the electronic age. Discounts for telecommunications services that make the Internet and distance learning accessible (called universal service discounts or "e-rate") will thereafter be made available to schools, libraries, and public and non-profit rural health care facilities from Alaska to Florida. Educators can no longer wait and watch—they must now act and make a commitment to implement technology into school settings. Information on the e-rate is available from your state education agency. The Schools and Library Corporation, which manages applications for the e-rate, has compiled an extensive collection of forms, documents, and advice on its Internet site.



http://www.slcfund.org

RELATED RESOURCES

Jones, B.F., Valdez, G., Nowakowski, J., Rasmussen, C. (1995). *Plugging in: Choosing and using educational technology*. Washington, D.C.: Council for Educational Development and Research.
http://www.ncrel.org/catalog/techno.htm

Means, B. & Olson, K. (1997). *Technology and education reform*. Washington, D.C.: U.S. Government Printing Office.

Software Publishers Association. (1997). *Report on the effectiveness of technology in schools, 1990–97*. Washington, D.C.: Author.
http://www.spa.org/publications/catalog/pg10.htm

U.S. Dept. of Education. (1996). *Getting America's students ready for the 21st century: Meeting the technology literacy challenge*. Washington, D.C.: Author.

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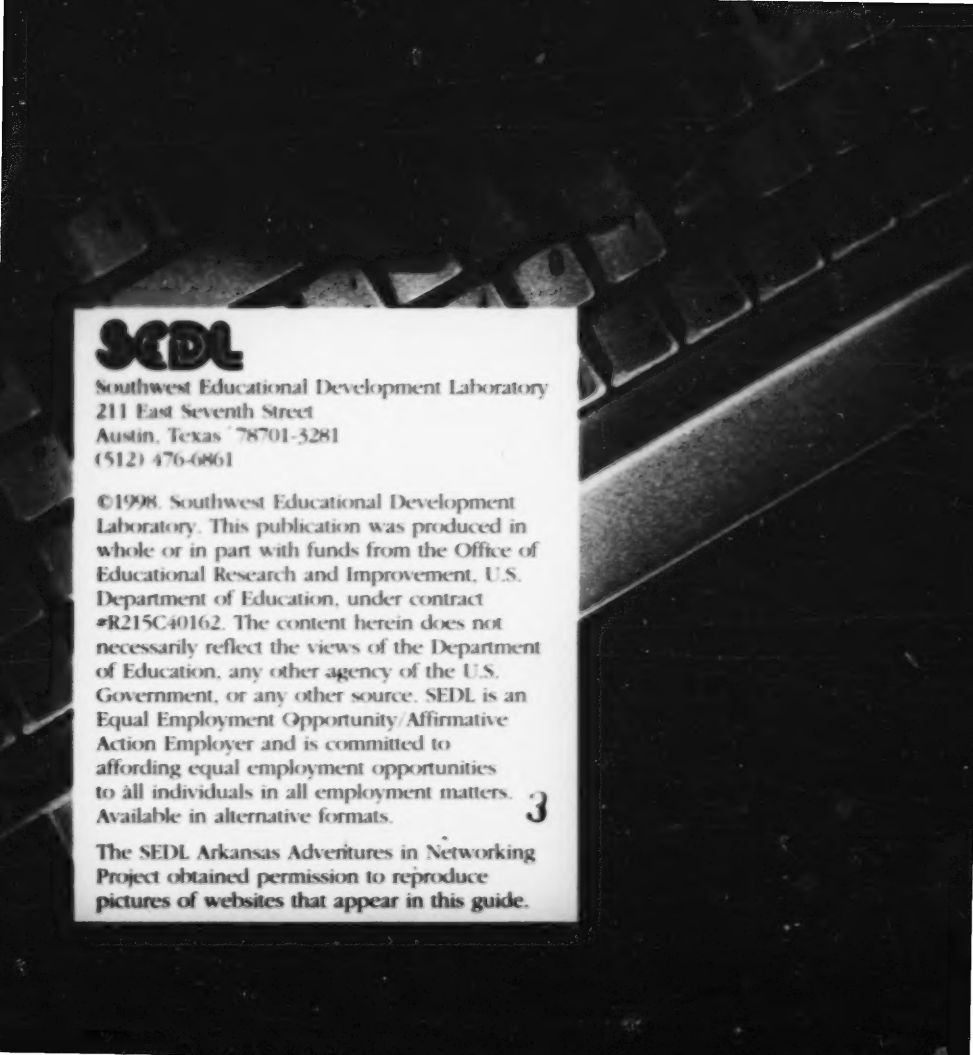

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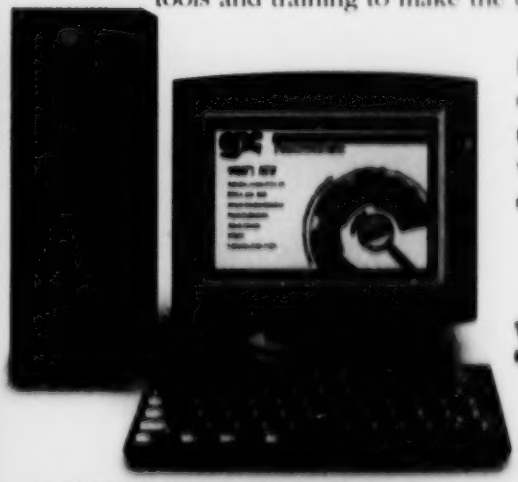
I'm too busy to get into technology. What's the least I need to know?

You don't need to be a technology expert, or a curriculum expert; but you need a strong vision.

As is true of many aspects of an administrator's job, what's required is a "big picture" understanding of the possibilities, necessities, and challenges of technology use—and the leadership skills to engage others in creating and carrying out a vision.

You do need to know how technology can and can't help kids to learn, and what's required educationally to use technology effectively as a teaching tool.

This involves some exposure to technology-based instruction. Using technology in the ways we're talking about really involves, for most teachers, a transformation in how they teach. Organizing instruction around learning problems, acting as a facilitator rather than as an expert, helping students work cooperatively, making discussion and dialogue the most common activities in the classroom—these are still novel ideas for many teachers. Others are working toward this vision of teaching, but need tools and training to make the changes work.



It is possible to use computers and other technology tools simply as replacements for textbooks and worksheets, or, at the other extreme, as novelties that provide

The Eisenhower National Clearinghouse offers a variety of professional resources.

excitement but little useful learning. Unless school and district leaders like yourself know what effective technology-based instruction looks like, it will be difficult to foster its growth among your entire teaching staff.

You'll need a basic familiarity with technology-related terminology, equipment, software, and networking operations.

For most of us, the technical aspects of computers and networks seem endless—and hopelessly complex. As an administrator, you should be able to get by without learning an entirely new language, but there are some basics you need to grasp in order to assure good decisions and monitor implementation. Electronic networking through the Internet and the World Wide Web (WWW) is the big push these days. So, unless you're already familiar with how electronic networking functions, that's where you'll need to aim your learning curve.

Though it's true there's no teacher like experience, it is not essential for you to be an expert in the use of computers or networks in order to be an effective leader.

You'll need to know some basics about the infrastructure requirements and consequences of various technology configurations for your schools.

Depending on the choices your district makes, you may need to consider a variety of issues, ranging from wiring and electrical capacity, to the number of phone lines in each school building, kinds of equipment, and even climate control.

You'll need to know how interested teachers, students, and the community are in bringing technology into the schools.

If interest is low, you'll need to take steps to build it. Technology that's imposed on unwilling participants will wind up on its own "shelf," along with other poorly thought-of instructional innovations.

You'll need to know how to develop a useful technology plan, and who to involve in the planning process.

It is essential to consider the district's technology plan as a blueprint rather than a hoop to be jumped through in order to meet state mandates or grant application requirements. Because of the complexities of technology implementation, effective planning becomes a make-or-break activity.

You'll need to know how much things cost, how to secure resources, and how to access the help you'll need.

Most importantly, you'll need to know where you can cut corners and where you can't. You can find out in this guide where to find funding for your technology plan, how to prepare teachers and staff, and how to maintain and manage your technology resources. And most importantly, how to avoid common pitfalls.

The remainder of this guide is intended to introduce you to the basics in each of these areas, and to point you to additional resources. Throughout this guide you'll find lists of resources that will help guide you through the process of putting technology into the classroom.

RELATED RESOURCES

Casson, L., Bauman, J., Fisher, E.R., Linkblad, M., Sumpter, J.R., Tornatzky, L.G., Vicery, B. S. (1997). *Making technology happen*. Research Triangle Park, NC: Southern Technology Council.
http://www.southern.org/pubs.htm#edtech

Where should I start?

Find out who's interested and who's not.

Painful experience with other educational innovations has taught us that any big change requires a broad base of support. It is almost never enough to have a visionary superintendent, or a small band of forward-thinking teachers, forging a lonely path through the wilderness.

Linking technology with instruction will cost both time and money. It will place new demands on teachers and students; it will change the way teaching looks in the classroom. The superintendent, principals, curriculum coordinators, teachers, school board members, parents—all will have questions, concerns, and reservations. Support from local business and community groups will also be important, since you're likely to need volunteer help and donations of funds or equipment.

Begin by taking the pulse of your community. Talk informally with all major constituencies, to get a sense of people's ideas, interests, and worries. Jot down questions and comments, both positive and negative. Don't rely on the opinions of a few; try to reach the broadest possible number. As you identify others who share your enthusiasm, enlist them to help with your informal needs-sensing.

Superintendents
Principals
Curriculum Coordinators
Teachers
School Board Members
Parents
Local Businesses
Community Groups
Students

Take steps to build the support you need.

If you find that interest is low—or concerns are high—within any particular constituency, you'll need to take the time to cultivate support. Don't assume that folks will "come around" once the ball gets rolling; don't be swept away by your own excitement or that of a few colleagues.

Some strategies for helping to generate interest and support:

- Involve school administrators, board members, and key teachers by arranging for them to visit demonstration sites. (Choose your strongest instructional leaders; don't pick only the "techie" teachers.) Ask them to talk to others about what they've seen.

- At PTA, civic club, and school board meetings, demonstrate some simple technology applications, such as a CD-ROM encyclopedia. Even better, have a student conduct the demonstration.

- If your school or district already uses some instructional technology, set up visits to those schools or classrooms or hold a technology open house for parents. Ask local industries to donate door prizes.

- Organize a study group to explore new uses of technology. Demonstrate your own commitment by taking an active part. Use the list of questions you've gathered to help focus the group's activities.

- Lead the process for developing a vision and a set of goals for how educational technologies can improve teaching and learning.

- If a school building is to be constructed or renovated, participate in the planning and design process so that technology requirements can be designed into the new facility.

- Nothing builds commitment faster than positive hands-on experience. If you have funds available, provide teachers, on an incentive basis, with laptop computers for their own personal and professional use. Or, seek out your local bank to see if they will set up a low-interest loan program through which teachers and students can finance their own computer purchases.

Initiate a formal technology planning process.

As interest begins to build, you may be tempted to plunge right into technology purchases. But first you'll need a careful, comprehensive planning process. As Ian Jukes noted in a recent article in *The School Administrator*, putting technology in schools "is not just about purchasing and installing hardware and software—it is about the physical and conceptual infrastructures which must be constructed to support the technology."

Plotting out technology choices is literally like drawing the blueprint for a skyscraper: An inch's miscalculation at ground level can be enormously magnified when it's time to build the seventh floor! Issues of cost, capacity, compatibility, environment, and longevity all need thoughtful consideration. Above all, it is essential to have a clear picture of *what it is you want the new technology to accomplish*.

The next two chapters will take you through the basic elements of technology planning.

RELATED RESOURCES

Jukes, B. & Dosaj, J. (1996). The essential steps of technology planning. *The School Administrator*, 53. (4).

How do we develop a technology plan?

Establish a technology planning committee; make sure it's representative.

Two common mistakes often disable local technology planning efforts before they begin. The first is when only a few people are involved; the second is when those few consist of an administrator and the resident technology enthusiasts. The purpose for using technology is to improve teaching and learning. Instructional goals must be at the center of technology planning, and all those concerned with such goals—from school board members to teachers to parents—need an active voice in the planning process.

By having a broadly representative planning committee, you also help to assure a plan that will be sustainable in spite of leadership changes, teacher turnover, or other surprises. A representative group also ensures the variety of experience and understanding needed to develop a workable plan.

Planning committees may range from as few as 8-10 to as many as 20-25 members. With a smaller number, you'll need to bring in other people as you create subcommittees to carry out specific tasks. Larger committees generally split into three or four subgroups to get the work done.

At a minimum, the committee should include the superintendent, a school board member, principal, curriculum coordinator or supervisor, technology coordinator or computer instructor if you have one (or a teacher with technology interests if you don't), one or more teachers who are strong instructional leaders, one or more parents, and a representative from a local business or civic group. You may also wish to include a student. Students often prove to be great technology resources; in some schools, students even act as troubleshooters and technical support volunteers.

In addition, you may want to include the services of a paid consultant who can provide technology expertise. But, keep in

mind that, while vendors and consultants understand technology, their understanding of education and public schools may be quite limited. Consultants can be a great help, but only if their input is considered in the context of local needs and local solutions.

Begin with a question: How can technology help us achieve the kinds of teaching and learning we want in our school(s)?

The planning committee's first work should be to establish an instructional vision. Consider what you want students to learn, not just about computers, but in all subject areas. Consider the instructional strategies teachers need to use to achieve those learning outcomes. Then consider the ways technology can help. Clearly, your technology plan will need to link closely to the district's comprehensive instructional plan.

The Thornburg Center, in its report, *Technology Planning for the Communication Age*, suggests a focus on the following questions:

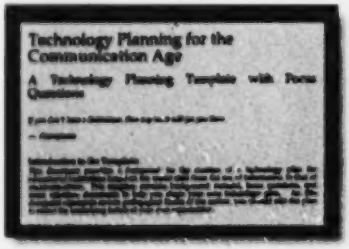
- How can technology help in exposing students to new concepts and ideas in the curricular areas?
- How can technology help learners acquire up-to-date information on the subjects they are studying?
- How can technology help learners work collaboratively with peers?
- How can technology be used to help students create interactive multimedia projects that serve as assessment vehicles for their studies?

A complete copy of this paper is available from the Thornburg Center web site:

http://www.tcpd.org/handouts/thornburg/TechPlan.pdf

or contact:

Thornburg Center
P.O. Box 7168
San Carlos, CA 94070-7168

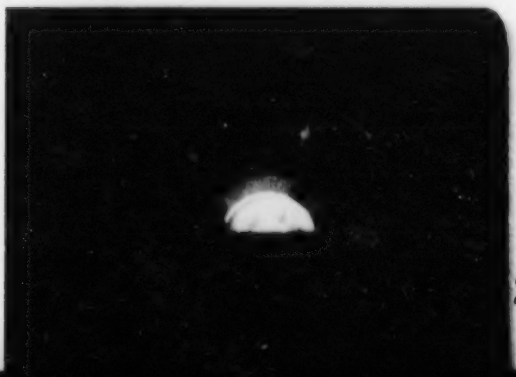


Conduct an audit of current resources.

It is important for the planning committee to get a clear picture of the technology resources and supports available in your school or district. There are a number of checklists, self-assessments, and other guidelines to help in building a thorough profile of current conditions. Common elements of an audit generally include:

- existing hardware and software. Don't limit your focus to computers; be as comprehensive as possible, including video equipment, graphing calculators, audiotape recorders, etc.
- levels of use of existing equipment and materials.
- infrastructure supports. These include wiring and cabling, power supplies, phone lines, available bandwidth, security measures, and the like.
- environmental conditions. These include asbestos-isolated areas, climate control, ventilation, lighting, acoustics, electromagnetic interference, protection from water hazards, and the like.
- skills and expertise. You'll want to do an extensive survey of teacher skills, but don't overlook expertise among students, parents, local businesses, and community agencies or organizations.
- local resources for funds, equipment, technical support, and other person-power.

Establishing an instructional vision provides an image of "there," or where you want to go. Conducting an audit provides a picture of "here," or where you are right now. Once you have sketched out both "here" and "there," you'll be able to prepare a roadmap to bridge the distance between the two.

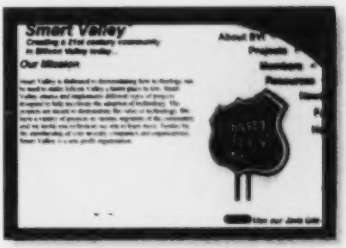


One resource to help that roadmap is Smart Valley, a nonprofit company from Silicon Valley, California. Smart Valley offers a number of technology planning guides in print and online formats. Check out its website at:

http://www.svi.org/

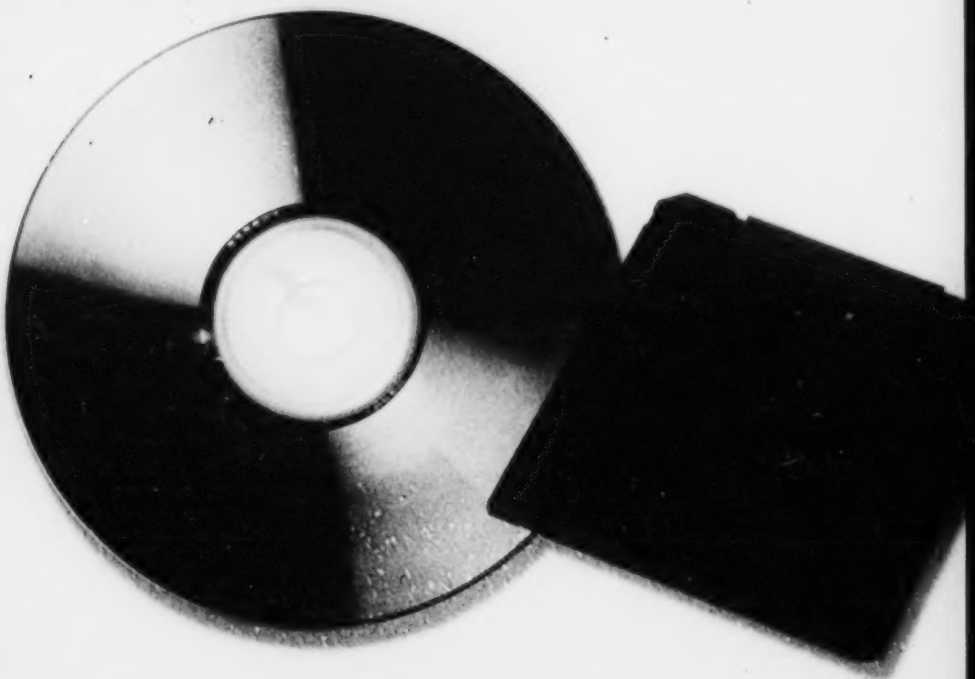
or contact:

Smart Valley, Inc.
155 Bovet Road, Suite 400
San Mateo, CA 94402
(650) 577-8907



RELATED RESOURCES

Lumley, D. & Bailey, G.D. (1997). Planning for technology: A guidebook for teachers, technology leaders, and school administrators. Bloomington, IN: National Educational Service. http://www.nes.org



What are the components of a good technology plan?

A description of instructional goals or outcomes.

As noted earlier, an effective technology plan begins with a focus on learning goals. These may be stated broadly or may list specific outcomes by grade level.

Specifications for hardware and software acquisitions.

A basic rule of technology acquisition is that hardware (equipment) purchases should be driven by the software (instructional materials and applications) that best suit your school or district's instructional needs. Compatibility and ease of use are important considerations in acquiring both hardware and software. Focusing on "cutting edge" or "state-of-the-art" items can be a waste of resources, unless they address a specific need.

One challenge in outlining hardware and supporting equipment needs is determining the right degree of specificity. If your plan is too general, it may fail to account for important constraints, such as cost or compatibility. On the other hand, if it's too specific, you may eliminate a choice that best suits local needs, or tie yourself to an outdated model. This is an area where consultant help can be invaluable.

Specifications for networking and multimedia access.

Items in this category may include wiring and cabling, provisions for a local area network, Internet services, and access to cable or satellite television lines.

Specifications for necessary facilities modification and other infrastructure supports.

It may be necessary to add electrical outlets or telephone lines, or to adapt heating, cooling, or ventilation systems. Or you may need to add or remove carpeting, alter acoustics, or repair a leaky roof.

A description of safety and security measures.

This may include not only concerns about physical safety and protecting equipment and supplies, but also provisions for assuring the security of student records, teachers' files, etc.

Provisions to assure equitable—and practical—access for teachers and students.

Experience tells us that "teachers won't use technology that is down the hall or in someone else's classroom" (Lamson & Barnett, 1994). Putting all of a school's computers into a lab classroom may simplify security concerns, but it doesn't necessarily assure the best or most equitable access for all students. Nor is putting a computer in every classroom always the best solution.

Provisions for professional development.

Almost every article on technology planning will tell you that teacher training is the most important element in a successful technology effort. Training needs to address not only basic technology skills, but strategies for changing instruction and integrating technology into daily classroom activities.

Provisions for system maintenance, troubleshooting, and technical support.

This is another critical but often-neglected topic. The chapter, "How can we get the troubleshooting help we'll need?" offers ideas and resources.

Provisions for evaluating the effectiveness of technology use.

You'll want to assess all elements of your technology initiative—from teachers' instructional use to the effectiveness of local policies regarding access, training, and support. Remember that, as is true with other educational innovations, it can take as much as five years for improvements to impact student achievement measures.

Provisions for updating technology systems as local needs warrant.

These days it seems that technology changes overnight. What's current today is old-hat tomorrow. Schools cannot, and do not need to, keep up with every technological innovation. At the same time, systems and software *will* become outdated; equipment *will* wear out. Your technology planning process should include provisions for review and updating every three to five years.

There is no single "model" for an effective technology plan.

You will find a number of templates, checklists, and frameworks to help guide the structure of your technology plan. But, as demonstrated by a recent competition conducted by *Electronic Learning* magazine, the Scholastic Network, and the National Center for Technology Planning, the best plan is one that suits local priorities and working styles. The five plans selected by contest judges varied tremendously in scope, length, and organization. All, however, were closely linked to instructional goals and were developed by a broadly representative planning group. And each represented a major investment of time and effort

Samples, Guides and Supportive Organizations

The National Center for Technology Planning. This website is a good source of information and materials for technology planning. You can view examples of technology plans from other states, districts, or schools.
http://www.nctp.com

Computer Accessibility Technology Packet. This packet includes information about the technical aspects of access, legal obligations concerning technology and individuals with disabilities, and a list of resources for further information and assistance.
http://www.ed.gov/offices/OSERS/techpack.html

The technology plan from the Decatur City Schools, Alabama provides a useful example.
http://www.ptc.dcs.edu/information/plan.html

Model Nets Guide: A Guide to Implementing Networking Technology in K-12 Education. This is an excellent resource for planning networking within a school or school district. This report comes from a nationwide study sponsored by the U.S. Department of Energy.
http://education.lanl.gov/RESOURCES/MNGuide/Education.html

The United States Department of Education. This site presents some USDE efforts to support technology in American schools. It offers information about grant opportunities, the e-rate, state and regional contacts for a variety of services and opportunities.
http://www.ed.gov/Technology

The Regional Technology in Education Consortium (R*TEC) is funded through the U.S. Department of Education to assist efforts to integrate technology in K-12 classrooms. Six R*TECs (listed below) serve regional clientele.
http://www.rtec.org/

- Northwest Educational Technology Consortium
  http://NETC.org
  or call: (800) 211-9435 or (503) 275-0658

- **Pacific and Southwest Regional Technology in Education Consortium (includes New Mexico)**
  http://psrtec.clmer.csulb.edu
  or call: (562) 985-5806

- **North Central Regional Technology in Education Consortium**
  http://www.ncrtec.org
  or call: (630) 571-4710

- **South Central Regional Technology in Education Consortium (includes Oklahoma and Texas)**
  http://scrtec.org
  or call: (888) TEC-2001

- **NetTech Consortium**
  http://www.nettech.org
  or call: (212) 541-0972

- **SouthEast and Islands Regional Technology in Education Consortium (includes Arkansas and Louisiana)**
  http://SERVE-Line.serve.org/seir-tec
  or call: (800) 659-3204 or (404) 893-0100

Within your State Department of Education, either the educational or instructional technology division will have detailed information about state technology initiatives, plans, and goals.

Regional Education Service Centers or Educational Cooperatives in your state may offer individual assistance or workshop settings that will help your planning efforts.

TESS is an excellent tool for evaluating software for purchase. It is available from the Texas Center for Educational Technology (TCET)
http://www.tcet.unt.edu/START/html/resview.htm
or contact:
EPIE: The Educational Products Information Exchange
103 Montauk Highway
Hampton Bays, NY 11946
(516) 728-9100
http://www.interhelp.com/epie_tess.htm

For hardware and software information, contact the educational divisions of the major software and hardware manufacturers, and the educational departments of local commercial retail vendors. A few examples of web sites are listed here, as a starting place, but most hardware and software vendors can be found online.

Microsoft Corporation—This website has information on software and even has a "roadmap" for technology planning.
http://www.microsoft.com/education/

V-Tel is a nationwide company that can provide assistance in planning for teleconferencing and interactive distance learning.
http://www.vtel.com:80/solution/edu

Apple Computer maintains a website for K-12 education as well.
http://ed.info.apple.com/education/index.html

RELATED RESOURCES

Anderson, L. (1996). ***Guidebook for developing an effective technology plan***. Mississippi State, MS: National Center for Technology Planning.

Association for Supervision and Curriculum Development (ASCD). (1998). ***Only the best: A guide to the highest-rated educational software and multimedia***. Reston, VA: Author.
http://www.ascd.org/select/sindex.html

Casson, L., Bauman, J., Fisher, E.R., Linkblad, M., Sumpter, J.R., Tornatzky, L.G., Vicery, B. S. (1997). ***Making technology happen***. Research Triangle Park, NC: Southern Technology Council.
http://www.southern.org/pubs.htm#edtech

Lamson, P.A. & Barnett, H. (1994, September). How technology can make a difference. *Thrust for Educational Leadership*.

The bottom line is, how can we afford it?

Look for grants and donations, but don't rely on them to cover your ongoing costs.

Grants and donations can be a great help in covering initial outlays for equipment, materials, and infrastructure supports. Federal initiatives, such as the Technology Innovation and Technology Literacy Challenge Grants, provide start-up funds. Also check with private foundations and corporations, especially those operating in your area.

More and more schools are setting up nonprofit foundations to encourage tax-deductible contributions from area businesses and individuals. Since this is a lengthy procedure, first check with your school district and then with the Internal Revenue Service to see if this a workable alternative. Filing the necessary paperwork and obtaining various approvals can take six months or more, so if you're considering this step, you'll want to get started as soon as possible.

Businesses are often willing to contribute used computers and other equipment. A new tax provision makes such donations even more appealing: A business can deduct the full purchase price of any computer that is donated within three years of its purchase. However, donated equipment sometimes causes more headaches than it's worth. Problems with compatibility are most common; a computer that won't run your software is of little use.

Contributions of time and expertise are often the greatest value a local business can offer. In California, for example, businesses sponsored a NetDay. Some 20,000 volunteers got together to run more than six million feet of wire in the state's schools. Since that event, a number of other states have followed this "barnraising" example. Volunteerism can work on a smaller scale, too.

Many people just getting started with technology think the initial purchase of hardware and software represents the bulk of their

expenses. But ongoing costs can and should represent a significant portion of a school's technology budget. According to some experts, for every dollar you allocate to hardware purchases, you need to budget 50 cents each for staff development, software, and maintenance. You'll need to find ways of supporting these continuing costs.

Reallocate your current resources.

Budget reallocations represent the most stable assurance that you can meet your technology budget. It may be necessary to re-examine the district's fiscal priorities (though, like most other small districts, you've probably stretched each penny about as far as anyone can). Some states allow schools to use a portion of their textbook allocations for technology-related purchases. If you receive Title I funds, you may be able to reallocate some of those expenditures to support technology costs. In addition, you may be able to streamline some administrative costs as you reduce paperwork through technology use.

Look for ways to collaborate and share resources.

Many small districts are setting up partnerships with other schools or area businesses and universities to share—or trade—technology resources. A little collaborative creativity can result in substantial savings. For example, one Florida school district allows cellular telephone companies in the area to build transmission towers at the edge of the district's football fields. In exchange, the district receives free wireless access to the Internet. Large grants from both public and private sources often require that several agencies are partnering in the effort. So, look at ways that several schools might collaborate with a university or another community organization.

Explore the numerous cost-saving options that are now available.

Computer-related costs are continuing to drop, allowing budget-minded consumers to purchase more power for their dollars. In addition, there are numerous low-cost computing tools, such as

the Apple eMate and the U.S. Robotics Palm Pilot; some geared specifically to schools. Be sure your planning committee does its homework in investigating low-cost technology options.

Also look into alternative purchasing methods, such as leasing rather than buying equipment or financing your purchases through low-interest loans.

Use the increasing number of federal and state options for supporting technology use.

Keep up with the ever-growing federal and state supports for technology use. For example, schools and libraries can get substantial discounts on their monthly Internet, telephone, and other telecommunications bills, as well as discounts on some other networking costs through the Telecommunications Act of 1996. The biggest discounts will go to rural schools and those with the highest proportions of low-income students. As noted earlier, more information about this act and how to take advantage of its benefits can be found on the School and Libraries Corporation home page.
http://www.slcfund.org

Beware of bargains.

Like most districts, you will be searching for the lowest cost alternatives for achieving your technology goals. But remember that, with technology, a bargain is not always a bargain. Saving a few hundred dollars on a computer purchase may end up costing you more in the long run if that purchase proves to be outdated in a year or two, or if the computer isn't compatible with the rest of your system. What may seem like a more expensive purchase ends up as the real bargain.

We can't emphasize this enough: No matter how tight your budget, you can not afford to cut corners on training and troubleshooting. There is no greater waste than technology that sits unused.

Try different program and grant resources.

Programs and grants are available from many sources that range from large, complex funding efforts from the federal government to small grants from local business or parent groups. The following list points to some established funding sources, but many times a local source, which only you can identify, is the best place to start.

If you want to pursue a federal education grant, these online resources offer possibilities.

"What Should I Know About ED Grants?" from the U.S. Department of Education
http://www.ed.gov/pubs/KnowAbtGrants

U.S. Department of Education, Office of Educational Technology
http://www.ed.gov/Technology/inititiv.html

U.S. Department of Education, Technology Innovation Challenge Grant
http://www.ed.gov/Technology/challenge/

U.S. Department of Education, Technology Literacy Challenge Fund
http://www.ed.gov/Technology/TLCF/

U.S. Department of Education, Star Schools Program
http://www.ed.gov/prog_info/StarSchools/index.html

National Science Foundation, Teacher Enhancement Program
http://www.ehr.nsf.gov/EHR/ESIE/teachenh.html

National Science Foundation, Elementary, Secondary, and Informal Education
http://www.ehr.nsf.gov/EHR/ESIE/index.html

National Science Foundation, Young Scholars Program
http://www.ehr.nsf.gov/EHR/ESIE/young.html

National Endowment for the Humanities
http://www.neh.fed.us

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U.S. Department of Defense
http://www.acq.osd.mil/ddre/edugate/index.html#gen

U.S. Department of Commerce, Public Telecommunications Facilities Program
www.ntia.doc.gov/otiahome/ptfp/index.html

U.S. Department of Commerce, Telecommunications and Information Infrastructure Assistance Program
http://www.ntia.doc.gov/tiiap/application/Ffinal.htm

U.S. Department of Agriculture, distance learning projects
http://www.reeusda.gov/programs/distanced/dist.htm

Private corporations and companies are also worth investigating. Some of these include:

AT&T - Educational programs
http://www.att.com/foundation/

Cisco Systems—Virtual Schoolhouse Grant Program, Networking Academies, International Schools CyberFair, Educational Archive
http://www.cisco.com/edu/

Microsoft Corporation
http://www.microsoft.com/education/k12/

Other sources that might be helpful:

The Computers for Learning project works to place surplus federal computer equipment in schools and educational nonprofits
http://www.computers.fed.gov/

"Foundation Resources, Community Networks, Telecenters, and Televillages," an article on private foundation sources for rural communities, is available through the Aspen Institute Rural Economic Policy Program
http://www.aspeninst.org/rural/foundres.html
or contact:
Aspen Institute Rural Economic Policy Program
1333 New Hampshire Ave. NW #1070
Washington, DC 20036
(202) 736-5834

National School Board Association's Institute for the Transfer of Technology to Education offers an array of print and online publications targeted for school leaders
http://www.nsba.org/itte/index.html
or contact:
NSBA
1680 Duke Street
Alexandria, VA 22314
(703) 838-6214

Electronic School
http://www.electronic-school.com/

Mid-continent Regional Educational Laboratory's (McREL) Funding for Technology page provides access to a number of reports, articles, strategies, and sources for funding
http://www.mcrel.org/connect/tech/funding.html

RELATED RESOURCES

American Association of School Administrators. *From here to technology: How to fund hardware, software, and more.* (1995). Arlington, VA: Author.

How can we assure that teachers and other staff are well prepared?

Provide for ongoing staff development; allocate 30 percent of your technology budget to training.

To be at all effective, training needs to be extensive, hands-on, and timely. A demonstration or two will not get teachers to use technology. You'll need to find ways to make staff development an ongoing activity. Some schools set up study groups, or work with businesses to find volunteer technology mentors. The Cupertino, CA school district, in addition to a five-day summer institute, provides "roving" substitute teachers. The substitute frees regular teaching staff for periodic, one-on-one training with a technology specialist.

Provide training in more than basic technology skills.

Teachers will need two types of staff development. They'll need to gain skills in using basic technology applications, such as a word processor, spreadsheet, web browser, and multimedia instructional materials. They'll also need assistance in integrating technology into their instructional activities. For many teachers, this may involve a basic shift in their teaching roles and their perspectives about how learning takes place.

Don't expect that teachers will make the shift on their own once they've gotten comfortable with a computer. As is true of any other instructional tool, technology can help to transform a classroom, or it can be adapted to fit a teacher's long-entrenched instructional style. Much of technology's potential will not be realized if the computer is not used in innovative ways. A worksheet is a worksheet, whether it's a mimeographed page or an image on a computer monitor.

Don't work your "technology hero" to death!

Especially in smaller districts, one or two people often end up in the role of "technology hero," taking the lead in planning, providing training and informal coaching, staying late to set up another teacher's computer or to work out a bug in the system, or making curricular adaptations for the entire grade level. While it's great to have heroes, all too often they burn out, especially if they're already carrying a full work load.

A better strategy is to provide extensive training to a group of teachers, then help them to take leadership roles in working with other instructional staff. If you must rely on a "hero," make the work a part of the staff member's formal duties. Relieve her or him of some other responsibilities, or offer extra compensation. Otherwise you're likely to lose a good employee, and you could be left in the lurch at a crucial moment.

These online resources provide professional development models for technology efforts.

Apple Computer's Classroom of Tomorrow program has provided invaluable insight for educators interested in incorporating technology in the classroom. This particular Internet development.
http://ed.info.apple.com/education/staffdev/

The Arkansas Adventures in Networking Project, part of SEDL's technology work, developed this online workshop for teachers.
http://www.sedl.org/aan/workshop

The Cupertino, California school district's model is available on their web site:
http://www.cupertino.k12.ca.us

RELATED RESOURCES

Bailey, G.D. & Lumley, D. (1994). *Technology staff development programs: A leadership sourcebook for school administators*. New York: Scholastic.

How can we assure equitable use?

Consider student needs in making software decisions.

In setting instructional goals and making purchasing decisions, the technology planning committee should consider the needs, interests, and resources of all the diverse student populations within your school or district—for example, gifted and other special needs students, language minority students, and students from low income families. Don't merely target a narrow spectrum of students; everyone can benefit from technology skills and technology-based instruction.

Make training available to everyone.

Likewise, don't target a narrow group of teachers for technology training and use. Do everything possible to encourage all of your teachers to incorporate technology into their daily instruction. Adapt training activities to teachers' various skill levels; help them to get comfortable with technology by encouraging their personal use of computers and networking services.

Consider alternatives to setting up a computer lab.

Computer labs have some distinct advantages. It's easier to cope with wiring and environmental and security measures for a single classroom. If you have more classrooms than computers, a lab offers one strategy for assuring at least some access to all teachers and students. But a lab also isolates computer use, making it an occasional, extraordinary activity rather than an integral part of the instructional routine. In an ideal world, there would be a computer for every student in every classroom. Of course, none of us live in an ideal world, but there are alternatives to labs that may work more effectively for your teachers. For example, encourage sharing by groups of teachers, either grade level groups or project groups, so they can make optimum use of a limited number of machines. Or, attach the computers to carts

that can be moved from one location to another so they can be gathered in one location when they are needed. If a computer lab is the only available option, try to provide flexible hours so students and teachers have some access to the equipment beyond their scheduled classroom periods.

Make sure technology is available to teachers who will actually use it.

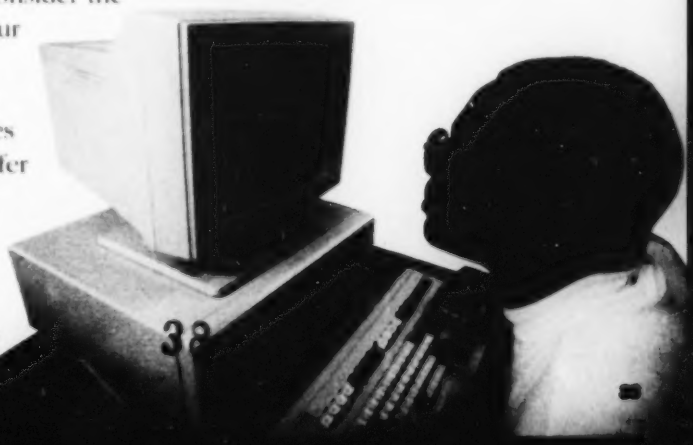
Though you'll want to encourage all teachers to use technology, not everyone will respond with equal enthusiasm, particularly in the first years. The adventurous teachers who will want to try the new equipment can provide experience and models for their more cautious colleagues. You may want to consider offering technology access on an incentive basis, rather than distributing equipment to every classroom or signing every teacher up for the computer lab. One district's strategy is an application process in which teachers must explain how they will use the technology before it is placed in his/her classroom.

Attend to accessibility issues for students with disabilities.

Technology offers a great variety of tools to assist students with disabilities, such as voice-activated computers, image-enhancing software, and hands-free accessing systems (for an array of such resources, see Adaptive Computer Technology Inc.'s web site:

http://www.compuaccess.com/dislink.htm

Be careful to consider the needs of all your students and to acquire any adaptive devices necessary to offer everyone full access to technology's benefits. Also consider issues



of physical access—wheelchairs and cables, for example, are not a good mix.

The *Computer Accessibility Technology Packet* was developed by the U.S. Department of Education and sent to all state and local education agencies to inform schools about the technology needs of disabled students.
http://www.ed.gov/offices/OSERS/techpack.html

Offer after-school access.

Consider making computers and other technology available after regular school hours, to your instructional staff, to students, and perhaps even to parents. Many families will have a computer at home, but others will not. Offering access to parents is a great way to develop their support for technology-based instruction, and to strengthen the links between home and school.

Work with business and community to promote technology access.

There are a number of ways you can encourage technology access throughout your local community. Making school facilities available after hours and during the summer is one alternative. Or, as suggested earlier, work with your local bank to encourage low-interest computer loans for students and educators. Or encourage community groups to offer technology scholarships. One creative school district worked with the local telephone company to arrange for the district's telephone lines to be diverted to the community library's computers after 4 p.m. each day, greatly increasing the library's Internet service capabilities.

RELATED RESOURCES

Cummins, J. & Sayers, D. (1995). ***Brave new schools: Challenging cultural illiteracy through global learning networks.*** New York: St. Martins Press.

Sanders, J. (1993). ***Lifting the barriers: 600 strategies that really work to increase girls' participation in science, mathematics, and computers.*** Port Washington, NY: Jo Sanders Publications.

How can we get the troubleshooting help we'll need?

Providing for ongoing, on-site help is a non-negotiable item if your system is going to work. Things *will* break; teachers *will* need help that instructional manuals and their own problem-solving skills cannot provide. If teachers can't get help quickly, they will avoid using technology. Just as no experienced conference presenter would use an overhead projector without having an extra light bulb in her or his pocket or purse, no self-respecting teacher will organize a lesson around a piece of equipment that could leave him stranded for the next hour.

Keep extra equipment on hand for emergencies.

Maintain a small inventory of items such as cables, disk drives, CD-ROM drives, modems, network cards, or monitors.

If possible, hire a full-time, on-call district technology coordinator or a campus-based computer lab manager.

Ideally, you would have full-time employees at both the district and school level.

Contract with local technicians.

If on-staff support is not an option, consider contracting with a local company or technician, just as you may do for maintenance on your heating system or school buses.

Try to keep a log of assistance requests.

If you're able to identify recurring or common problems, you may be able to train teachers to address them, freeing your troubleshooting staff or volunteers to cope with other problems.

A log that lists problems and their solutions can be an invaluable resource.

Look for volunteer help within the community.

Volunteers can provide troubleshooting and technical support, though it's imperative that they be used in conjunction with on-site staff support. If you use volunteers, try to offer incentives in return. One school offers free Internet dial-in capability to its volunteers. Some schools use student volunteers, offering course credit in exchange for troubleshooting assistance.

Send faculty for extensive training.

You can build expertise among your teaching staff by sending a core group for extensive training in technology use, maintenance, and troubleshooting. Be careful about making one or two of the staff responsible for helping everyone else. If you must rely on support from teachers, offer incentives to compensate them for the extra work—extra planning time, a stipend, personal use of a laptop computer, or free personal Internet access.

How can we keep our systems up-to-date?

Continually evaluate the effectiveness of what you're doing.

You'll need to establish both formal and informal strategies for monitoring and assessing the effectiveness of your technology initiative. Data-gathering should address a number of questions: How well is the equipment working? How frequently are problems reported? What kinds of problems are occurring? How satisfied is the staff with the technical assistance and troubleshooting help they receive? How many teachers are using the new technologies? How often? In what ways? What are teachers' perceptions about the relevance and effectiveness of staff development? What are teachers' concerns about the impact of new approaches on their classroom routines? What are parents saying and feeling about the new approaches? What changes are you seeing in classroom instruction, in students' behaviors, and—eventually, but remember, this will take time, probably several years—in student outcomes?

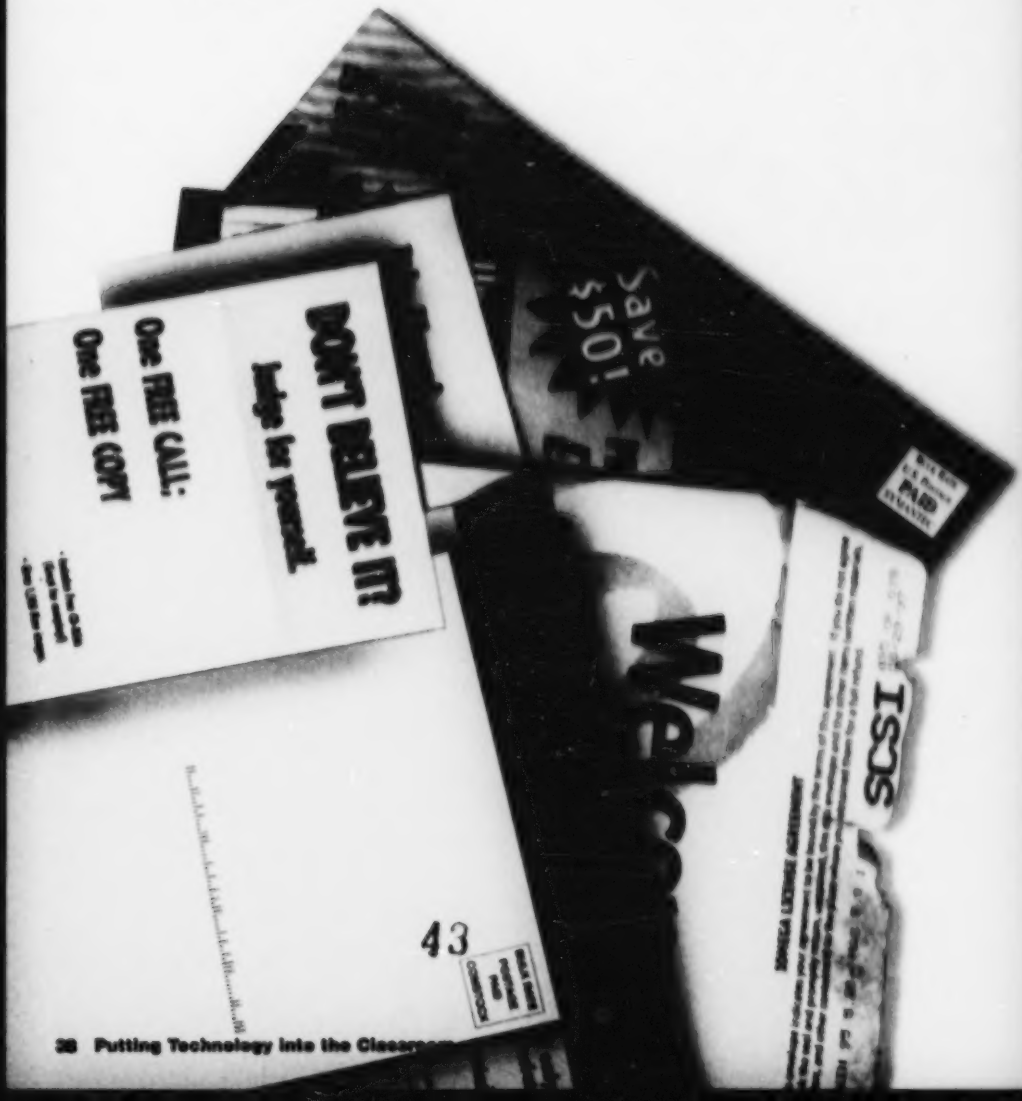
Make strategic decisions about upgrades.

Almost as soon as you make your technology purchases, newer, more powerful versions of your brand new hardware and software will no doubt appear on the market. You'll receive upgrade notices almost as often as you get credit card offers. Occasionally software upgrades are free, but not usually.

When should you upgrade? Always make this decision based on your instructional goals and your staff's assessment of how well the current arrangements are addressing those goals. If you do upgrade, be sure to provide time and technical assistance to help your staff adapt to the changes.

Revisit your technology plan every three to five years.

Your technology planning process should include provisions for reviewing and updating the plan at least every three to five years. Though planning shouldn't take as much time after the first cycle, be sure to go through all the steps again, revisiting the instructional goals, updating the audit, assessing infrastructure needs, investigating new products, considering staffing, security, and facilities arrangements, etc. If you've been collecting assessment data all along, updating the plan will be a much easier task.



What are the most common pitfalls in technology planning and use, and how do we avoid them?

Most of these items have been discussed earlier, but they are important enough to bear repeating. In case you've skipped to the end of the story, we refer you back to relevant chapters where appropriate.

Moving ahead without gauging people's interest or securing commitment to the change.

Teachers already overloaded with mandates for change, parents who consider technology-based instruction an expensive diversion from basic skills, a school board worried about the bottom line—any of these can derail even the most promising technology initiative. Taking time to lay the proper groundwork for change may be the best investment you can make. (See "Where should I start?" on page 11.)

Having only one or two people develop the technology plan.

Work by committee may seem cumbersome, but in this case it's a necessity. Above all, you need a group capable of envisioning the ways in which technology can support effective teaching and foster the kinds of skills students will need in their adult lives. (See "How do we develop a technology plan?" on page 14.)

Considering the technology plan as a bureaucratic requirement rather than as an essential blueprint for your effort.

More and more states are requiring district technology plans; funding sources often require them as well. If you've already

breezed through one of these mandated forms, *resist the temptation* to recycle it. A realistic plan will save you not only money but indigestion.

Thinking that, once you're through with the technology plan, you're through.

Of course reality never quite matches the plans we make. But the biggest job of implementing a good technology plan is maintaining your instructional vision. Strong leadership and ongoing support are essential to making the kinds of instructional changes discussed in this guide. Moreover, you'll need to revisit your planning process periodically, at least every three to five years, in order to keep your systems functioning and up to date.

Failing to match technology resources to the local infrastructure.

We know of one school that can't run its air conditioning system and its computers at the same time. A careful audit could have uncovered this problem. (See "What are the components of a good technology plan?" on page 18.)

Relying on "soft money" for your technology program.

There are many ways to fund technology through federal, state, and corporate grant dollars, and the wise administrator will secure as much of this support as possible. However, technology requires a solid source of funding, which means it must be a part of the school's permanent budget. While grants may provide an initial bounty of hardware, software, and training, schools must establish an internal support system for staffing, equipment repairs, and refurbishment. (See "The bottom line is, how can we afford it?" on page 24.)

Falling prey to hype about a particular piece of hardware or software.

Technology vendors, as well as the technology enthusiasts on your staff, will make their pitches for cutting-edge hardware and

software, urging your committee to buy the next great thing. Assessing what's best for your situation is always a challenge, especially given the rapid changes in the field. But if the planning committee will (1) start with a focus on instructional needs, (2) make systems compatibility, upgrade capacity, and ease of use higher priorities than bells and whistles, (3) do their homework (i.e., research everything thoroughly), and (4) get expert help when they need it, they'll make sound decisions.

Making short-term purchase decisions that don't allow for growth, or that create compatibility problems.

At the opposite end of the pendulum is the danger of making poor purchasing decisions in an effort to hold down costs. A bargain is a bargain only when it works; computers or software that sit unused are costly at whatever the price.

Being too general, or too specific, in laying out specifications for purchases.

As noted earlier, this is an area where an expert consultant can be of great help. Or study technology plans that other school districts have developed. You can find a number of sample plans, along with tips and guidelines, online.

Under-investing in teacher training.

Inadequate teacher training is a major barrier to the integration of technology into the classroom. The old idea that technology might *replace* teachers is long-dead; teachers must know more, not less, in order for technology to help kids become effective learners. (See "How can we assure that teachers and other staff are well prepared?" on page 30.)

Not planning for technical assistance.

If you've tinkered with technology at all, you've probably learned at least two lessons about fixing problems: One, the instructional manuals don't always help. Two, you can't always rely on intuition or experience to figure out a solution. Your staff will need

someone they can call on for technical assistance, someone who can talk them through a procedure and solve problems that aren't addressed in the manual. (See "How can we get the troubleshooting help we need?" on page 35.)

Being too impatient to see results

Technology planning alone sometimes takes as much as a year. As those with experience have noted: "Even with all of the elements properly in place, it will still be three to five years before you'll see widespread changes in educational structures and instructional delivery at a systematic level." (Jukes, 1996) Expect a lengthy process—but remember: you're not merely putting a piece of equipment on a desk, you're changing the way teachers teach and the way students learn.

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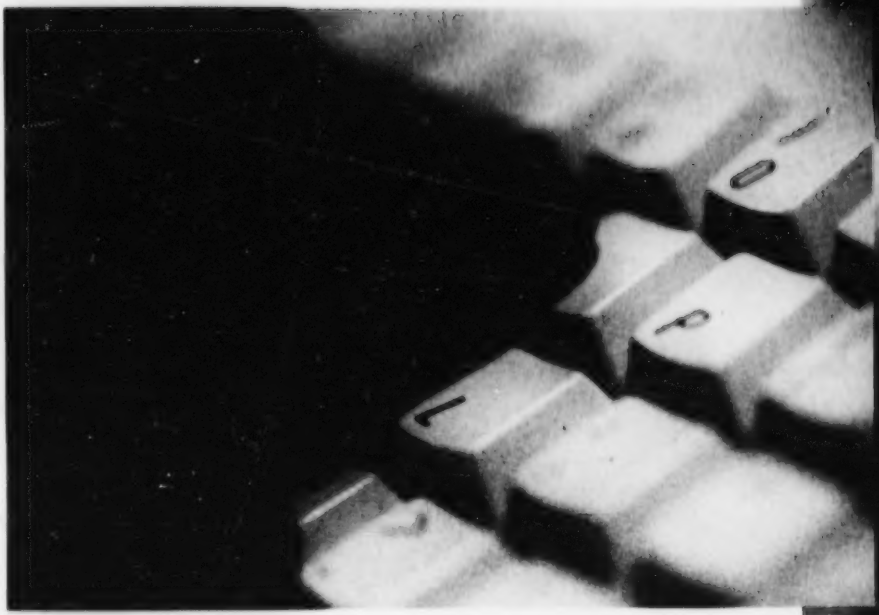

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